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THE CASTLE-BUILDING SPIDER.

By DR. J. L. HANCOCK.

Illustrations by the Author.

The sandy wastes bordering the lower end of Lake Michigan, in Northern Illinois, are inhabited by several species of tube-constructing spiders. Though any one of the forms occurring here would repay study, for the present I will consider a species which, from the peculiar habit of building a little castle or nest at the opening to the tube, makes it of more than ordinary interest. This Lycosid is likely to be taken at first glance for the turret-spiders L. *arenicola* or L. *turricola*, but it is quite distinct from either of them. The spider is equally expert whether engaged as a carpenter, weaver, mason or digger, all of which attributes she brings to bear some time or other in making her completed retreat. The female shown in the illustration, Fig. 1, is always found in the burrows when dug out of the ground, unless some mishap has overtaken her.

In the Fall of 1896 I found my way into an uncultivated lot where weeds in profusion had unbounded sway, cenchrus being particularly in evidence. Patches of high grass, sedges and ragweeds made the open lay of ground a paradise of running spiders. Here it was the castle-building species seemed perfectly at home, showing its varied accomplishments to best

advantage. The artfully hidden castle is not apparent to the uninitiated while walking over the ground, as it is commonly secreted in a recess of overhanging dried grasses. Frequent visits to several localities added greatly to my observations, and, though the greater number were made in the late fall, at the suggestion of Mr. Emerton, some time was spent in June, in the following and present year, in anticipation of finding them mating. In this I was disappointed and all efforts to find the male was fruitless.

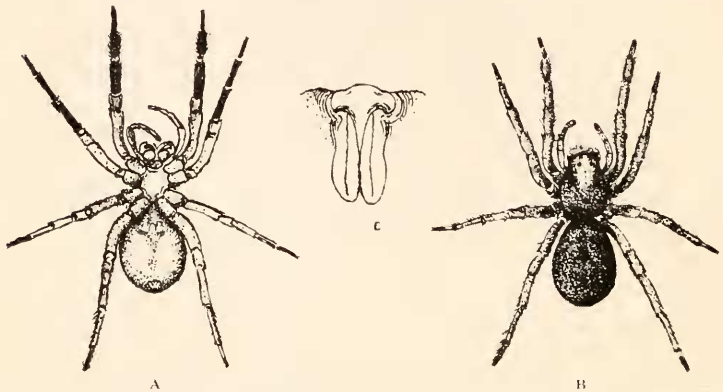

FIG. 1. (a) The Castle-building Spider, ventral view. (b) Same, dorsal surface. (c) Female epiginum. Original from nature.

One of the castles which I alluded to above, the first of my discoveries, will be described as a means of furnishing a general idea of the kind of nest made, afterwards recurring to the subject of castles further on, when considering the tubes throughout. When one remembers the average size of the adult castle, only five-eights of an inch high, and a little over one-half inch in diameter, it is obvious that close inspection is quite essential.

This castle was situated beside a half-buried piece of branch, a site which was chosen often. Around it was growing little seedlings and lichens which grew from the superficial deposit of vegetable mould, and giving to the surroundings the effect of a small garden colored with sienna and green. The nest proper was quite round; fragments of chickweed, bark and rootlets, woven together with silk, went to make up moest of the structure, while to one side a dried leaf of ragweed was aesthetically curved around and attached, leaving other bits of leaves

incorporated into its margin. Two grass leaves were brought down from a plant near by and festooned to two sides, the finishing touch being a dagger-pointed bur poised on the margin. By the time several nests were examined I found evidence of the most whimsical tastes in the selection of material for nests, an enumeration of which is here given:

Green and dried grass leaves, dried fine sedges, spikes and leaves of foxtail grass, fibrous roots, ragweed leaves curved by drying, cenchrus or burgrass spikes and burs, wing of beetle, weather beaten white paper, piece of brown string, twigs of various kinds in bits, dark bark, seeds of weeds, bird excrement, sand made into pellets, small stones and gravel from soil.

Exploring the tubes with a straw was not without reward, for I found by feeling the way down carefully, until meeting resistance, the live spider when touched communicates a motion to the straw sticking above the ground. To learn more of the occupant one has but to dig a hole down at the side to avoid injuring the castle, then making an undercut below extending to the tube; follow it down to the bottom where the spider rests with its head pointing upwards. The Fall of the year finds various sized individuals of different ages preparing to pass the winter in burrows. Sometimes just within the castle a fine screen of silk is woven across the entrance as an obstruction against floods or the possible entering of hymenopterous enemies, which is again torn away after all danger is passed.

The young, even down to the smallest, show a wonderful instinct for castle building. This I saw depicted in the dainty character of many of their works. Activity is expressed on every side at this period of the year. Little yellow sand pellets encircling the openings told plainly that the spider's year is nearing a close. They had a forewarning of the coming winter and sought refuge by deepening their retreats to get safely below the freezing line. The love of warmth was exemplified even after the first fall of snow, for the appearance of the warm sun's rays enticed them to come up to get a last glimpse of the sun from the top of the castle. From what I gleaned, old spiders live in their burrows for more than a season and often remodel them after being injured by storms. They hold great fondness for their homes and try resolutely to stick by them.

going out long enough only to catch insect food. Even this is seldom, for much food is taken in at the very threshold of the castle. Younger specimens re-dig outgrown burrows, enlarging them as occasion requires. It was interesting to observe neighborly beetles and other species of spiders, not to be outdone, with one accord churn up the soil by their diggings.

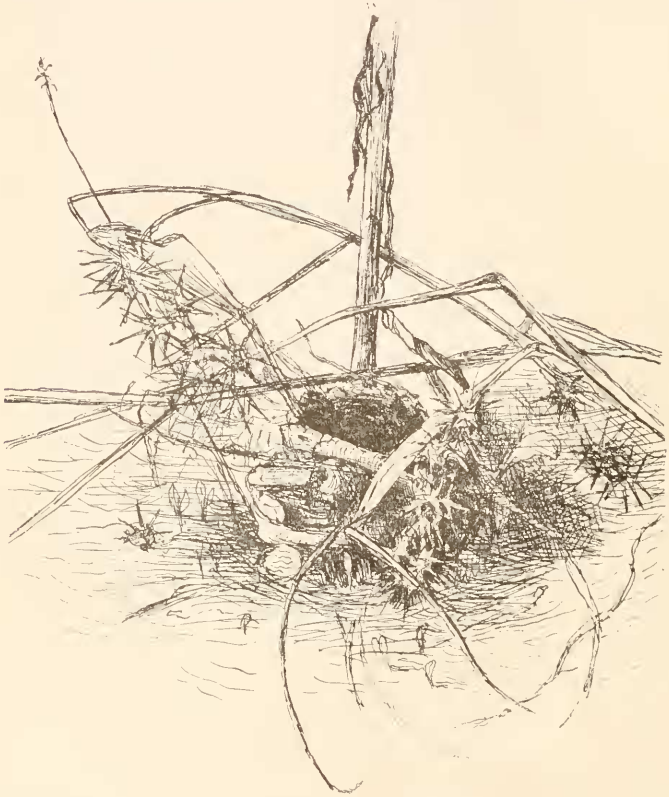

FIG. 2. A castle or nest of the Castle-building Spider, natural size, from nature, by the author.

When the vernal spell is changed by lowering temperature, quiet creeps upon the scene. Usually the spider's tube is constructed vertically in the ground unless, as is shown in the reduced plate illustration, obstructions cause some deviation. The four different examples here shown were opened from the side, being careful to preserve their form. A silk lining is put on by the spider, which is continuous with the inside of the

castle. In the construction of the tube damp earth facilitates working materially, but being equal to the occasion the spider can dig a tube in dry sand, requiring extra effort and a good deal of ingenuity. The process is so simple, however, when compared with the complicated mechanism used by one contemplating sinking such a shaft on a large scale that it is worthy of special note. In setting out to make the tube she proceeds with some slight variation in the following way: Standing on tiptoe the spider moves her abdomen around almost in a circle between her legs, touching the ground here and there with the spinnerettes at the end of the body. The silk pouring out catches fast in the soil, and in a moment an adherent round flooring of about ten millimeters across is formed. Then she turns about, digging up the little silk mat entangled with sand, and in a twinkling has made it into a parcel, which is laid to one side. Again she spins out silk over the same spot and dexterously lifts up the mass, lays the pellet beside the preceding, until by repetitions she has temporarily encircled the newly-made pit with her internal diggings. At times she stands head down in the hole and pats down the new-formed mouth with her inverted abdomen. Within an hour she is down the depth of her body and the hole excavated sufficiently large to turn around in, but now each parcel after being made is snapped from her mandibles with a sudden motion of the palpi when up to the entrance. As she progresses the tube is lined with silk, often going over the surface to prevent any caving in of the earth. Now we find her taking a well-earned rest, and not until darkness is fully established does she commence her castle. In vivarium I watched spiders by artificial light under conditions quite natural. Coming out of her tube I saw her grasp a prickly sphere of burgrass, and taking it to the burrow she adjusted it to the border of the opening. In a few moments she gathered two more of the burs, one at a time placing them to form a partial border; the intervening spaces between them were filled with sand pellets, which she made and brought up from the inside of the tube. Taking this to be the foundation of her future castle, I took the opportunity of trying an experiment, that is, of furnishing material. The ground, quite bare near her tube, was strewn with a selection of short pieces of bleached

grasses, the top of a foxtail grass, which I had seen composing other nests, beside some weed stems, and three little rolled pieces of red, white and blue paper. The spider, which had disappeared for a time below the surface, now came to the opening, and walking over to one of the grasses she picked it up and carried it to the edge, where, letting it go, she turned around within the tube and attached it at the middle to the entrance with multiple strands of silk. Another grass stem was next taken, which she laid crossing the first, on top of the half buried burs. Then her attention was drawn to the weed stems, which in like manner were disposed of and imbedded in silken pellets. In their turn then came the red paper, a straw and sand bundle, placing them with the same scrupulous neatness. The bit of white paper was drawn to the side and fastened, and lastly the blue paper found a resting spot, all the material which I supplied having been used in embellishing the towering castle, which was now nearly an inch in height. Referring again to the plate illustration, *a*, shows a tube which penetrated ten inches of the soil; it was finished with a curious castle, having as an ornamentation on top two spikes of the bristly foxtail grass. The interior was slightly enlarged just within. A slight difference is shown in the tube *b*, the work of a larger spider with somewhat faded abdomen. As is often the case in old specimens, she had not exercised all her latent talents, for a few bits of twigs and a dilapidated leaf constituted her castle, scarcely raised above the ground. Quite a contrast is presented by the tube *c*, made by a younger individual. Her artistic culture was more freely displayed in an excellently built castle, which I have drawn as a separate illustration, Fig. 2. Surprising industry is shown in the length of the tube, nearly two feet. As if fortified against invasion the castle was adorned with a spike of nine prickly heads of burgrass; beside the side of the passage was also placed a cluster of burs almost touching the entrance.

At the margin a small twig was set on transversely, serving as a little stepping pillar on which the spider chose to climb in getting in and out. The tube *d* has the middle slightly enlarged, showing the ending of what was formerly the Summer quarters, while now it is continued down as a Fall or Winter extension. The spider found in the bottom of this cellar

was fully grown, measuring nearly three-quarters of an inch in length. Several castles are sometimes found naturally grouped near together, within a radius of twenty feet or thereabouts, but the tube last mentioned was isolated in a lonely field. The castle presented no special interest and will be passed over without further comment. It will be seen that the castle builder, unlike the known turret spiders, rarely builds the nest in a strictly pentagonal form, as has been frequently observed; for instance, in *Lycosa arenicola*. In the gradation between the young and older spiders' nests there is the widest diversity. Young specimens not infrequently build a perfect little tower, almost entirely of stones, and one I have in mind had nine such particles made into a compact edifice five millimeters high. The masonry was exquisitely put up, every stone bearing out true proportions, about the central opening of four millimeters diameter. Silk used as cement held the whole together securely.

I once saw a reflection of sombre forebodings when exposing an immature spider's tube; the light fell into the palatial cellar only to find it changed into a chamber of horrors, for instead of the spider a black insect like a nervous villain commenced jerking her wings of mourning like one in secret hiding bent on some treacherous mission. An orange spot on the upper part of her body, together with other markings, told the species, *Pompilus marginatus*.

Pompilus is figured in the plate illustration *a*, and from her position the inference may easily be imagined. When teased with a straw so her patience is sorely tried, the castle builder will stand her ground in self-defense and present as formidable a picture as can be supposed. She instantly responds to such threats with open jaws, at the same time raising up the two front pairs of legs high in the air. In this attitude she favors the conspicuous display of black under the outer three joints of the extremities, which in repose is not shown.

I succeeded in keeping specimens alive several years and discovered quite a number of interesting traits during this acquaintance well worth the care bestowed on them. Reserving the technical description for a separate article, I may add finally that the name *Lycosa domifex* is given to the species, whereby it may be known hereafter in scientific nomenclature.